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with the Author's Compliment

THE LOCALISING VALUE OF OPTIC
NEURITIS IN INTRACRANIAL
TUMOUR.

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DURING the last thirty years general opinion has wavered greatly as regards the certainty and frequency with which optic neuritis is produced by a growth within the cranium, and the greatest authorities from time to time have made diametrically opposite statements with regard to this condition. At various times it has been stated that optic neuritis has no localising value as regards the seat of disease, and at other times the directly contrary opinion has been put forward. Thus Dr. Hughlings Jackson in 1880 stated that "optic neuritis is of no value in localising disease in any part of the cerebrum or cerebellum," and Mr. Horsley now holds that optic neuritis is of distinct value in locating the position of the disease, more particularly as regards the side on which the disease is situated. But it is when we come to the question of unilateral optic neuritis that we find the greatest difference of opinion. For some observers state that in a case in which optic neuritis appears only in one eye, or appears in one eye before the other, or is more marked in one eye than in the other, the seat of lesion is on the opposite side of the brain; whereas others equally positively state that the lesion is on the same side as the eye in which the optic neuritis first appears or is more marked. It is as an attempt to try to arrive at the true facts of the case by examining rather a larger number of reports than has been presented before that I now bring forward the results of my analysis of 600 cases, which I have collected from various sources. Before I begin the discussion of the special subject of this paper it will be of some value—if only to confirm the researches of former investigators—to give a general analysis of my series of cases and then consider the question of the localising value of optic neuritis. The result will not be so complete as I had hoped it would be, as in very few cases comparatively has it been noted in which eye the optic neuritis appeared first or was more marked.

It has always been stated that the male sex is more liable to intracranial growths than is the female sex. The numbers in my series are as follows :—

TABLE I

Position of tumour.	Male.	Female.	Sex not stated.	Total.
Frontal	31	17	13	61
Temporo-sphenoidal	13	10	5	28
Motor area	77	22	22	121
Parieto-occipital	19	10	8	37
Multiple	18	9	1	28
Basal ganglia	20	12	4	36
Corpus callosum	7	5	1	13
Centrum ovale	19	10	1	30
Corpora quadrigemina	12	3	0	15
Pituitary	13	9	4	26
Crura	3	1	1	5
Pons and medulla	29	11	4	44
Cerebellum	82	34	22	138
General	10	7	2	19
Total	353	160	88	601

So that of 513 cases of intra-cranial tumour 68·8 per cent. were males and 31·2 per cent. were females; that is, the male sex is more than twice as liable as the female sex to intra-cranial growth.

Having here given my first table it will perhaps be well at this point to define the regions I have adopted. Frontal—those tumours situated in front of the ascending frontal convolution externally, and as far back as the genu of the corpus callosum internally. Temporo-sphenoidal—those situated in the part of the cerebrum below the fissure of Sylvius and limited posteriorly by a line drawn from the posterior end of the fissure of Sylvius above to the lower end of the ex-occipital fissure below on the outer surface, and by the calcarine fissure on the mesial surface. Motor area—those situated in the precentral, post-central, and paracentral convolutions and their immediate neighbourhood. Parieto-occipital—those situated in or near the remaining cortex of the brain. As regards the remainder, all that need be said is that they affect only or chiefly the structures under the names of which they appear. Those included under “general” were either too diffuse to be put under any more definite heading or else their actual position was not stated in the report from which I obtained my abstract.

The nature of the growths in each position will be found in the next table (Table II.); the significance of the small

figures in the top right-hand of some of the figures will be explained subsequently (see Table VI.). From this it will be seen that of the 442 named tumours 126 were sarcomata, 82

TABLE II.

Nature of tumour.	Tuberculous.	Sarcoma.	Glioma.	Glio-sarcoma.	Cystic.	Carcinoma.	Gumma.	Hydatids.	Other tumours.	Total.
Frontal	3 ¹	16 ³	8	5 ²	2 ²	2	6 ³	3	16 ¹	61 ¹¹
Temporo-sphenoidal	1	8 ²	5	0	2	1	3	2 ¹	6 ⁴	28 ⁷
Motor area	8 ⁵	29 ¹²	13 ³	6 ¹	5 ¹	3	13 ³	3	40 ²¹	120 ⁴⁹
Parieto-occipital	1	11 ²	6	1	1 ¹	1	2	3	11	37 ³
Multiple	8 ⁴	6	2 ¹	0	1	1	4 ²	2	4 ²	28 ⁶
Basal ganglia	7 ²	3	7 ¹	5 ²	1	0	0	1 ¹	12 ³	36 ⁹
Corpus callosum	0	4 ³	0	2 ¹	0	0	0	0	7 ⁴	13 ⁸
Centrum ovale	2 ¹	6 ³	3 ¹	1	3 ²	0	1	3	11 ⁵	30 ¹²
Corpora quadrigemina	2	5	2	0	1	0	1	0	4	15
Pituitary	2 ¹	5 ¹	2 ¹	0	2	2 ³	1	0	12 ³	26 ⁸
Crura	0	1	0	0	0	0	0	0	4	5
Pons and medulla	12 ⁷	5 ¹	12 ²	1	1	1	2 ¹	1 ¹	10 ²	45 ¹⁴
Cerebellum	25 ⁵	20 ³	21 ³	9 ²	25 ²	0	3	3	32 ³	138 ¹⁸
General	1	7 ²	1	0	0	0	0	0	10 ¹	19 ³
Total	72 ²⁶	126 ³²	82 ¹⁵	30 ⁸	44 ⁸	11 ²	36 ⁸	21 ³	179 ⁴⁹	601 ¹⁵¹

were gliomata, and 72 were tuberculous—a result which differs from Starr's¹ as below.

	Starr.	J. M. M.
Sarcoma	22.6	28.5
Glioma	17.2	18.5
Tuberculous	36.4	16.3

} percentages.

While I was abstracting my cases it seemed to me worth while to notice the chief position of the headache in each case where it was mentioned, as, so far as I am aware, there are no statistics on this point: but the result is only to confirm the prevailing idea that the position of the headache is of no value in determining the position of the tumour (see Table III.). The only points to which I will draw attention are the number of cases of tumour of the motor area and of the corpus callosum in which headache was stated to be

¹ Nervous Diseases, edited by F. X. Dercum, p. 471.

absent, the frequency of occipital headache in cerebellar tumours, and of frontal headache in all kinds of tumours.

The results of my analysis of these 600 cases as regards the presence of optic neuritis are in accord with the generally accepted statements, but I have gone rather more into detail than has usually been the case; thus I have separated the cases in which optic neuritis was noticed into four groups, with the idea of seeing whether any new facts would be brought out; these groups are—(1) those cases in which the optic neuritis was stated to be unilateral; (2) those in which the optic neuritis was beginning late in the course of the disease; (3) those in which the optic neuritis was early and marked; and (4) those in which the optic neuritis went

TABLE III.

Position of tumour.	Position of headache.									
	Stated to be absent.	Frontal.	Frontal and occipital.	Occipital.	Vertical.	Temporal.	Fronto-temporal.	Parietal.	Fronto-vertical.	Occipito-vertical.
Frontal	1	12	2	5	—	1	—	1	1	—
Temporo-sphenoidal ...	1	3	—	—	1	1	1	—	—	—
Motor area... ..	5	12	2	1	3	—	4	5	2	—
Parieto-occipital	*	5	1	3	—	—	—	—	1	1
Basal ganglia	—	6	—	1	—	1	—	—	2	1
Corpus callosum	4	—	—	1	—	1	—	—	—	—
Centrum ovale... ..	2	5	1	3	1	1	—	—	1	—
Corpora quadrigemina ...	1	1	—	3	—	—	—	—	—	—
Pituitary	—	1	—	—	—	1	—	2	—	—
Pons and medulla	2	3	2	3	1	—	—	—	—	1
Cerebellum	—	18	7	23	1	—	—	2	4	2
General	—	5	—	—	1	1	—	1	—	—

on to atrophy or in which atrophy was first noticed (see Table IV.). Before I go fully into the table I will draw attention to the comparatively small number of cases which go on to atrophy in the following groups:—(1) the pons and medulla; (2) the temporo-sphenoidal; (3) the motor area; (4) the corpus callosum; and (5) the corpora quadrigemina (here notice the large proportion of cases in which optic neuritis is found). The number of cases of tumour of the crura is too small for me to draw any general conclusion from them. Optic neuritis is constantly present in tumour of the corpora quadrigemina, so that in the absence of optic neuritis we can

exclude this position for the tumour. The cerebellum and parieto-occipital regions come second with optic neuritis in 39 per cent. of cases, but a marked difference is noticeable in the two groups when we come to Table IV., column iv., excluding optic atrophy; here the cerebellar region leads by 13 per cent. The only other special point to which I will draw attention is the comparatively small proportion of cases in which optic neuritis is found in tumours of the corpus

TABLE IV.—*General Table for Optic Neuritis.*

—	Totals.	No optic neuritis.	Unilateral. Optic neuritis beginning late.	Optic neuritis marked.	Atrophy.	Not mentioned.	Percentages (see footnote).				
							I.	II.	III.	IV.	
Frontal	61	10	3	7	31	10	0	84	33	67	61
Temporo-sphenoidal	28	9	0	5	10	2	2	68	50	50	46
Motor area... ..	121	46	3	16	48	6	2	62	54	46	43
Parieto-occipital ...	37	4	3	4	22	3	1	89	30	70	68
Multiple	28	9	1	4	8	5	1	68	50	50	39
Basal ganglia	36	9	0	3	17	6	1	75	33	67	60
Corpus callosum ...	13	7	0	2	3	1	0	46	69	31	25
Centrum ovale... ..	30	10	1	4	11	3	1	67	50	50	40
Corpora quadrigemina	15	0	0	3	11	1	0	100	20	80	79
Pituitary	26	9	0	0	8	9	0	65	35	65	47
Crura	5	0	0	2	1	0	2	100	40	60	60
Pons and medulla ...	44	14	4	8	15	3	0	68	59	41	36
Cerebellum	138	15	2	4	91	25	1	89	15	85	81
General	19	3	1	5	7	3	0	84	47	53	44
Total	601	145	18	67	283	77	11	76	38	62	56

PERCENTAGES.—I., in which optic neuritis was present some time in the course of the disease. II., in which optic neuritis was late, absent, or unilateral. III., in which optic neuritis was present early in the disease. IV., in which optic neuritis was present, excluding atrophic cases.

callosum and of the pons and medulla—a fact which is still more marked when we exclude “atrophic” cases. If we exclude the eight cases of the pons series in which internal hydrocephalus was produced, and in every one of which optic neuritis was found, the figures will stand:—Cases, 36; no optic neuritis, 14; unilateral, 4; late, 6; marked, 9; and atrophy, 2 (special reasons), which will make the percentages as follows: Cases in

which optic neuritis was present some time during the disease, 56; cases in which optic neuritis was present early in the disease, 26·4. Thus the absence of optic neuritis early in the disease is a characteristic of tumour of the pons. Before leaving this point I will arrange the groups in their order—(1) according to the percentage of optic neuritis (all cases); and (2) according to the percentage of cases in which optic neuritis is late, absent, or unilateral.

(1)	(2)
1. Corpora quadrigemina.	1. Cerebellum.
2. Crura.	2. Corpora quadrigemina.
3. { Cerebellum.	3. Parieto-occipital.
{ Parieto-occipital.	4. { Basal ganglia.
4. { Frontal.	{ Frontal.
{ General.	5. Pituitary.
5. Basal ganglia	6. Crura.
{ Multiple.	7. General.
{ Pons and medulla.	8. { Centrum ovale.
{ Temporo-sphenoidal.	{ Multiple.
{ Centrum ovale.	{ Temporo-sphenoidal.
7. Pituitary.	9. Motor area.
8. Motor area.	10. Pons and medulla.
9. Corpus callosum.	11. Corpus callosum.

I come now to the table of the cases in which optic neuritis was unilateral or more marked on one side than on the other, and among them I have included three (motor area) which were clearly diagnosed at the National Hospital for the Paralysed and Epileptic, Queen-square, but which have not been operated on and have not reached a fatal termination (Table V.).

TABLE V.—*Unilateral Neuritis.*

Tumour.	Optic neuritis more marked on the side of the lesion.	Optic neuritis more marked on the side opposite to the lesion.	Totals.
Frontal	8	2	10
Temporo-sphenoidal	4	0	4
Motor area	14	3	17
Parieto-occipital	2	4	6
Multiple	2	0	2
Basal ganglia	1	0	1
Centrum ovale	1	2	3
Corpora quadrigemina ...	1	0	1
Pituitary	0	1	1
Pons and medulla... ..	3	2	5
Cerebellum		1	4
General	0	1	1
Total	39	16	55

From this it will be seen that I have been able to collect only 55 cases useful for this purpose, but in future a much larger proportion will be available, as the amount of swelling of the papilla is being measured in each eye much more accurately than has been done in the past. Yet even here there are quite sufficient data to justify one in stating absolutely that the seat of lesion is probably on the side on which optic neuritis is more marked in the proportion of 71 to 29. If we take the first three groups in the table among which we have the largest number of cases the results are as follows: total on the side of the lesion, 26; on the side opposite to the lesion, 5; total, 31. The percentage in favour of the lesion being on the side of the optic neuritis is 84.

Turning now to the question of the effect of the nature of the tumour in producing optic neuritis, I have in Table II. (small figures above referred to) included the number of cases in which optic neuritis was absent or very slight in connexion with each kind of tumour in each region. The individual numbers are too small to give any satisfactory results, but on taking the totals the percentages are sufficiently striking to be worth noticing (Table VI.).

TABLE VI.

—	No. of tumours.	Optic neuritis absent.	Percentage.
Tuberculous	72	26	36
Sarcomata	126	32	25
Gliomata	82	15	18
Glio-sarcomata	30	8	27
Cystic	44	8	18
Carcinoma	11	2	18
Gumma	36	8	22
Hydatids	21	3	14
Total	422	102	24

The conclusions then are: (1) that optic neuritis is most often absent if the tumour is tuberculous; and (2) that optic neuritis is most frequently present if the tumour is a glioma, is cystic, or is a hydatid.

The last set of statistics I have worked out is that in relation to strabismus in cases of intra-cranial tumour; there were only thirty cases in which I could get a clear idea of this condition from the reports; the result is as follows (see Table VII.). Hence in cases in which internal strabismus is noticed the tumour is generally on the same side.

Before bringing my paper to a close I will sum up the general results which I have obtained:—1. That 68·8 per cent. of all cases of intracranial tumour are among males. 2. That the most common form of intracranial growth is

sarcoma; gliomata and tuberculous tumours are of about equal frequency, but less common than sarcomata. 3. That headache is more likely to be absent in cases of tumours of the motor area and of the corpus callosum than when the tumour is situated elsewhere. 4. That the tumour is generally situated on the side on which internal strabismus is noted.

Has, then, optic neuritis any localising value in intracranial tumour? It has, yet only to a limited extent at present; but under the improved methods of examination now adopted it will be of more value in the future. Where a difference in the amount of the optic neuritis in each eye is

TABLE VII.

	Internal strabismus.		External strabismus.	
	On the same side.	On the opposite side.	On the same side.	On the opposite side.
Multiple	2	—	—	—
Corpora quadrigemina	2	1	—	—
Basal ganglia	—	—	1	—
Parieto-occipital	3	1	—	—
Crura	1	—	—	—
Pons and medulla	5	—	—	—
Temporo-sphenoidal	3	1	—	—
General	1	—	—	1
Cerebellum	5	—	1	—
Motor... ..	—	1	—	—
Centrum ovale	1	—	—	—
Total... ..	23	4	2	1

noted it is more than twice as probable that the tumour is on the side of the more marked optic neuritis. Beyond this little can be said, but at the same time it should be remembered: (1) that optic neuritis is constantly present in tumours of the corpora quadrigemina; (2) that it is present in 89 per cent. of cases of cerebellar tumour and of tumours of the posterior part of the cerebrum; (3) that it is absent in nearly two-thirds of the cases of tumour of the pons and medulla and of the corpus callosum; and (4) that it is least frequently met with in cases of tuberculous tumour and most common in cases of glioma and cystic tumour.

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